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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,525	09/09/2003	Kenneth E. Hrdina	SP02-199P	4733

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CORNING INCORPORATED
SP-TI-3-1
CORNING, NY 14831

EXAMINER

DEHGHAN, QUEENIE S

ART UNIT	PAPER NUMBER
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1731

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/07/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No. 10/659,525	Applicant(s) HRDINA ET AL.	
	Examiner Queenie Dehghan	Art Unit 1731	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-22 is/are pending in the application.
- 4a) Of the above claim(s) 22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 4-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 4-5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570) and Ramsay (4,389,385). Clasen et al. disclose a method comprising providing an aqueous sol including a solid phase of an amorphous titania-containing silica powder, forming the sol into a titania-containing silica shaped gel having a homogenous distribution of titania ([0031], [0033], [0034], [0047]), drying the gel ([0048]), and heating to form a glass body ([0041]). However, Clasen et al. fail to

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disclose how the powder is formed. Hasenzahl et al. teach utilizing titania containing silica powder, that has been prepared by flame hydrolysis of a mixture of organometallic silica and titania precursors, in an aqueous sol (col. 3 lines 32-37). It would have been obvious to one ordinary skill in the art at the time the invention was made to expect that flame hydrolysis of the silica and titania precursors would result in the mixing of the silica and titania on an atomic scale. Furthermore, Ramsay also teaches the using silica and titania powders in the preparation of sols, wherein the powders were obtained by flame hydrolysis. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the titania containing silica powder prepared by flame hydrolysis and suggested by Ramsay and Hasenzahl et al. in the preparation of the sols of Clasen et al. because flame hydrolysis produces powders in a fine particle size that is suitable for the dispersing into a liquid to form a sol, as taught by Ramsay.

4. Regarding claims 4 and 5, Clasen et al. disclose making titanium oxide/silicate glass with a titania concentration of 7.4wt%. As previously mentioned, Hasenzahl et al. and Ramsay disclose a process for making titania-containing silica powder. Although Hasenzahl et al. do not teach the titania content of the powder, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the powder making method of Maxon et al. to obtain the desired 7.4wt% titania content in the powder and subsequently the glass body resulting for use of the powder, as disclosed by Clasen et al. in order to produce the desired low CTE in the finished glass body.

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5. Regarding claim 12, Clasen et al. disclose using mixtures of silica powder, titania containing silica powder and titania powder ([0034]). Furthermore, Clasen et al. disclose the further mixing of the titania containing silica powder with an alkoxide containing titanium, as well as an alkoxide containing silica ([0034], [0043], [0044])

6. Claims 6-7 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO01/72419 as represented by US 6,849,570) and Ramsay (4,389,385), as applied to claim 4 above, in further view of Nordberg (2,236,059). Regarding claims 6-7, Clasen et al. fail to disclose a CTE in the range of about +10ppb/°C to -10ppb/°C. Nordberg teaches a $\text{TiO}_2\text{-SiO}_2$ glass with a CTE of 0.1×10^{-7} between 0°C and 300°C (page 1 line 8, table). A glass body with a CTE in a temperature range between 0°C and 300°C, will also obviously have the same CTE in a temperature range between 20°C and 35°C, since it is encompassed. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the suggested CTE of Nordberg in the product of Clasen et al. in order to ensure dimensional accuracy over a desired range of temperatures when using the glass body. Regarding claims 10-11, Clasen et al. fail to disclose a sintering temperature above 1600°C to sufficiently melt crystalline phases. Nordberg teaches heating a titania containing silica body to a temperature of 1600°C or above, which is sufficient to melt crystalline phases, resulting in a transparent glass body. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the heating temperature of Nordberg in the process of Clasen et al. in order to produce a clear glass body.

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7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), Ramsay (4,389,385), and Nordberg (2,236,059), as applied to claim 6 above, in further view of Fujiwara et al. (6,587,262). Although Clasen et al. and Nordberg fail to disclose a specific size and shape of the glass body made, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the versatility of a sol gel method to produce a glass body of any desired shape and size. Fujiwara et al. teach a glass body to be finished into a photomask substrate that has a diameter of 7cm and a length of 26 cm, which is further finished and pressed to have a diameter of 23cm. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the dimensions of the glass body of Fujiwara et al. as an example for the dimensions to be achieved from Clasen et al., Hasenzahl et al, Ramsay, and Nordberg process in order to manufacture a photomask substrate.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), and Ramsay (4,389,385), as applied to claim 12 above, and in further view of Nordberg (2,236,059) and Yoldas (4,278,632). Clasen et al. briefly disclose the prior art of Nordberg for making $\text{TiO}_2\text{-SiO}_2$ glass. Nordberg teaches making titania-containing silica powder by flame hydrolysis (page 3 lines 42-58) as well as a desired titania content of about 9% to 11% (page 1 lines 40-50, table). Yoldas teaches a process for making a sol comprising titanium alkoxide and silicon alkoxide (example VI).

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Yoldas also teaches the desired for the sol to have a titania to silicon ratio of 10:90 (Example V). The 10% titania content of the sol is approximately equivalent to the titania content of the powder of Nordberg. As mentioned above, Clasen et al. disclose mixing TiO_2 - SiO_2 powders, and alkoxides of titania and silica together, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the titania content disclosed by Nordberg and the titanium to silicon ratio in the sol of Yoldas in the process of Clasen et al. in order provide for a homogenous sol.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), and Ramsay (4,389,385), as applied to claim 1 above, in view of Seiko Epson Corp. (Derwent Abstract of JP 62252330). Clasen et al. fail to disclose mixing with an aqueous base and acid. Seiko Espon Corp. teaches a first solution of a precursor material with a basic reagent and second solution of the same precursor material with an acidic reagent prior to mixing the two solutions together. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the mixing of an acidic solution with the basic solution, as suggested by Seiko Epson Corp, in the process of Clasen et al. in order to properly hydrolyze the precursor material of titania containing silica powder of Clasen et al. and to achieved the desired pH of the sol.

10. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), and Ramsay (4,389,385), as applied to claim 1 above, in view of

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Kirkbir et al. (5,473,826). Clasen et al. fail to disclose the use of a solvent for drying. Kirkbir et al. teach a solvent used for drying gels under hypercritical temperatures and pressures (col. 3 lines 55-63). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the drying solvent and conditions of Kirkbir et al. in the drying step of Clasen et al. in order to produce a gel free of cracks, as taught by Kirkbir et al.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), Ramsay (4,389,385), and Kirkbir et al. (5,473,826), as applied to claim 16 above, in further view of Blackwell et al. (5,154,744). Clasen et al. and Kirkbir et al. fail to disclose the further heating of the gel in halide gas. Blackwell et al. teach sintering a titania-silica preform in the presence of helium and chlorine. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the halide gas of Blackwell et al. in the heating step of Clasen et al. in order to provide an inert atmosphere for sintering the porous gel.

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Kirkbir et al. (5,473,826), as applied to claim 16 above, in further view of Yoldas (4,278,632). Clasen et al. and Kirkbir et al. fail to disclose the further heating of the gel under vacuum pressure. Yoldas teaches a heating step comprising using a vacuum (example IV). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the vacuum

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pressure of Yoldas in the heating step of Clasen et al. in order to provide a denser glass body free of contamination while the pores of the gel are closed.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Hasenzahl et al. (WO 01/72419 as represented by US 6,849,570), and Ramsay (4,389,385), as applied to claim 1 above, in view of Nakajima (English Abstract of JP 63123825). Clasen et al. fail to disclose a finishing step.

Nakajima teaches finishing a sintered gel into a photomask substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the finishing step of Nakajima in the process of Clasen et al. in order to provide a usable glass body utilizing the low CTE property of the glass.

14. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Nordberg (2,236,059), and Nakajima (English Abstract of JP 63123825). Clasen et al. disclose a method comprising providing an aqueous sol including a solid phase of titania-containing powder, an alkoxide containing titanium, as well as an alkoxide containing silica ([0034], [0043], [0044]), as indicated by the mixtures thereof, forming the sol into a titania-containing silica shaped gel having a homogenous distribution of titania ([0031], [0033], [0034], [0047]), drying the gel ([0048]), and heating to form a glass body ([0041]). Furthermore, Clasen et al. disclose making titanium oxide/silicate glass with a titania concentration of 7.4 wt%, but not specifically a powder. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize powder with the proper concentration of titania, 7.4% for instance, in order to obtain the desired 7.4wt% titania content in the

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subsequently formed glass, which is made from the powder, in order to produce the desired low CTE in the finished glass body. In addition, Clasen et al. fail to disclose the use of a solvent for the drying step. Kirkbir et al. teach a solvent used for drying gels under hypercritical temperatures and pressures (col. 3 lines 55-63). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the drying solvent and conditions of Kirkbir et al. in the drying step of Clasen et al. in order to produce a gel free of cracks, as taught by Kirkbir et al. Furthermore, Clasen et al. fail to disclose a sintering temperature above 1600°C to sufficiently melt crystalline phases. Nordberg teaches heating a titania containing silica body to a temperature of 1600°C or above, which is sufficient to melt crystalline phases, resulting in a transparent glass body. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the heating temperature of Nordberg in the process of Clasen et al. in order to produce a clear glass body. Clasen et al. do disclose making titanium oxide/silicate glass with a titania concentration of 7.4 wt%, but do not mention a CTE in the range of about +30ppb/°C to -30ppb/°C. Nordberg teaches a TiO₂-SiO₂ glass with a CTE of 0.1×10^{-7} between 0°C and 300°C (page 1 line 8, table). A glass body with a CTE in a temperature range between 0°C and 300°C, will also obviously have the same CTE in a temperature range between 20°C and 35°C, since it is encompassed. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the suggested CTE of Nordberg in the product of Clasen et al. in order to ensure dimensional accuracy over a desired range of temperatures when using the glass body. Although the glass body formed by the

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process steps of Clasen et al., Kirkbir et al. and Nordberg do not specifically disclose an extreme ultraviolet optical element, it would have been obvious to one of ordinary skill in the art at the time the invention was made expect an extreme ultraviolet optical element to result from completing the process steps of Clasen et al., Kirkbir et al. and Nordberg.

15. Claims 8 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clasen et al. (2002/0026810) in view of Nordberg (2,236,059), and Kirkbir et al.

(5,473,826), as applied to claims 7 and 20 above, in further view of Hrdina et al.

(Proceedings of SPIE, vol. 5037). Clasen et al. and Nordberg fail to disclose a variation of the CTE of less than about 10ppb/°C. Hrdina et al. teach a TiO₂-SiO₂ glass with a CTE variation of less than 10ppb/°C (section 3.1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize small CTE variation of Hrdina et al. in the process of Clasen et al. in order to provide for a glass that meet the requirements of EUVL optics and photomask substrate applications, as taught by Hrdina et al.

Response to Arguments

16. Applicant's arguments filed December 13, 2006 have been fully considered but they are not persuasive. The applicant presented several arguments regarding the prior art of Clasen et al. Claim 1 does not limit the sol to contain **only** titania containing silica powder, and even though Clasen uses a secondary component, Clasen still teaches the used use of titania containing silica powder as a primary component in the preparation of a sol. The applicant also points out that additional components can be used, but are not required. The claimed invention does not exclude the requirement for other

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components in the sol. Furthermore, claim 12 recites the use of two alkoxides together, which Clasen also suggests in paragraphs [0043] and [0044] and explains that the titania alkoxide is used for the redensification of the porous molding and that the silicic acid is used for increasing the strength of the moulding. In regards to the homogeneity of the sol prepared by Clasen, the applicant speculates that the process of Clasen does not allow for a homogeneous sol; however, Clasen specifically points out that the product is homogenous in paragraph [0033].

17. In regards to the prior art of Nordberg, Nordberg was used to teach the desirability for glass to have a very low CTE in order to ensure dimensional accuracy when using the glass body.

18. In regards to claim 9, the prior art of Fujiwara was used simply to exemplify a glass body with a desired size. The examiner is confused as to the statement that Clasen *without its secondary component* was combined with Maxon and Nordberg.

19. In regards to claim 14, the '330 publication teaches sol preparation steps where an acidic solution and a basic solution is first formed and further mixed:

20. Applicant's arguments with respect to claim 2-21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Queenie Dehghan whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



STEVEN P. GRIFFIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Q Dehghan